Via FCC Electronic Comment Filing System

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Federal Communications Commission
445 12th Street SW, Room TW-A325
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Re: Comment on the September 28, 2016 National Test (PS Docket No. 15-94, DA 16-803).

I would like to comment on national test conducted by the Federal Emergency Management Agency (FEMA), in collaboration with the FCC, on September 28, 2016. The nationwide test assessed the reliability and effectiveness of the EAS, with a particular emphasis on testing FEMA's Integrated Public Alert and Warning System (IPAWS), the integrated gateway through which common alerting protocol-based (CAP-based) EAS alerts are disseminated to EAS Participants.

Test Performance

In Washington, DC, I sampled five broadcast radio and two broadcast television stations during the national test. Overall, the national test broadcast sounded and looked good on all the stations. But one Washington, DC radio station broadcasting a couple of minutes of silence instead of the national test message. One television station's text crawl included only the EAS header text without the CAP text.

EAS/CAP Monitoring Source	Time Received	Notes
IPAWS	14:20:24 EDT	
WETA FM	14:20:40 EDT	
WDCH FM	14:20:50 EDT	
WTOP FM	14:20:59 EDT	
WMAL FM	14:21:08 EDT	
WJLA TV	14:21:11 EDT	
WRC TV	About 14:21 EDT	Text crawl EAS header not CAP text
WMZQ FM (HD-1)	About 14:22 EDT	Minutes of silence

From reports on Twitter and YouTube, elsewhere in the country the national test generally worked well. There were some reports of test messages without any audio message, a text-to-speech version, or a degraded re-broadcast of the audio message. Although the systems generally worked as designed and specified, the results may not be the best desired. But those are anecdotal reports. The EAS Test Reporting System should have nation-wide test coverage data.

Test Initiation Description

FEMA initiated the national test through the IPAWS channel only, and included both English and Spanish versions of the message text and audio file links. FEMA did not transmit the test message through the classic EAS Primary Entry Point (PEP) channels. Overall, the IPAWS distribution system appeared to work. FEMA initiated the national test on time, and the IPAWS content distribution networks seemed to handle the load. The human announcers of the English and Spanish audio files were calm, clear and understandable. The audio messages matched the CAP message description/instruction text.

IPAWS implements several information security capabilities. During the national test, the IPAWS security capabilities worked well. However, preparing for the test, on September 12, 2016, the IPAWS digital certificate expired. CAP devices which checked CAP signatures rejected the weekly IPAWS test messages, and would also reject any actual alerts signed with expired certificate keys. FEMA renewed the IPAWS certificate. Then on September 14, 2016, IPAWS transmitted a weekly test message using the 000000 All-USA location code. Because FEMA had never documented it would use 000000 with a RWT, many participants did not configure their EAS equipment to accept that test. The 2016 FCC EAS Operating Handbook eliminated essentially all guidance and operational details about how the national system is expected to work or how participants should configure EAS/CAP equipment. Previously on August 12, 2016, all DHS domain names using DNS Security expired when the DHS DNS signing keys were not renewed properly. Any EAS participant using DNSSEC would not accept domain names with expired signatures, and stopped retrieving IPAWS messages.

FEMA did not appear to monitor its DNSSEC systems, or when various DHS and FEMA certificates expire.

Test Reception Description

CAP devices at EAS participants usually poll the IPAWS content distribution network for new messages every 30-60 seconds. Content distribution networks (CDNs) used by IPAWS do not immediately have new messages available in every distribution cache, so it may take a several of polling intervals to populate all the CDN caches (a cache miss). After retrieving the CAP message, the CAP device also tries to retrieve the associated audio file from the Uniform Resource Location (URL) in the CAP message. Polling and subsequent message retrieval may take just a few seconds or several minutes.

At the same time, EAS devices at EAS participants are also monitoring two or more Local Primary, State Primary and National Primary analog EAS monitoring sources. Analog EAS sources transmit only the analog audio message and digital EAS header. They do not distribute the complete CAP message, such as the CAP description/instruction text fields. Analog EAS transmissions distribute one EAS message at a time. If an EAS device misses decoding the EAS header, it cannot retry later.

EAS/CAP devices latch on to the first monitoring source a message arrives, i.e. IPAWS CAP or analog EAS source. Although §11.54(c) allows EAS participants to choose between alternative sources of the President's voice message; currently, no EAS/CAP devices check for alternative sources of the same EAS/CAP message.

Although it wasn't a problem for the national test, how EAS manufacturers update the IPAWS CAP certificates as they expire will be an operational concern. Especially for EAS/CAP equipment when the manufacturer goes out of business or stops supporting a particular model.

System Worked as Designed, but Could Work Better

The Emergency Alert System now includes both classic EAS analog distribution and CAP digital distribution. The integrated system is more complicated. The EAS-CAP Implementation Guide outlines some, but not all, the interactions between EAS and CAP message processing. The result is at least four different audio messages and two different video text messages (Figure 1 - Flowchart of EAS/CAP processing).

Different versions of the audio message:
1. Radio transmission quality audio message
2. Digital file quality audio message
3. No audio message
4. Text-to-speech audio message (optional)

Different versions of the video text message:
1. Only the EAS digital header translation (Originator, Event, Locations, and the valid time period)
2. The EAS digital header translation plus the CAP description and instruction text

In some cases, a Local Primary or upstream EAS monitoring source retrieved the National Test message first and transmitted one of those versions. If the Local/State Primary did not purchase or activate an optional Text-to-Speech capability, it could transmit only the EAS digital headers and no audio message. Downstream EAS participants following the first-source rule, then immediately relayed a degraded version of the audio message (or no audio message); and may not have the full CAP text for the video text crawl. It could receive, but will not use, just moments later a better version of the same message from a different monitoring source or IPAWS directly.
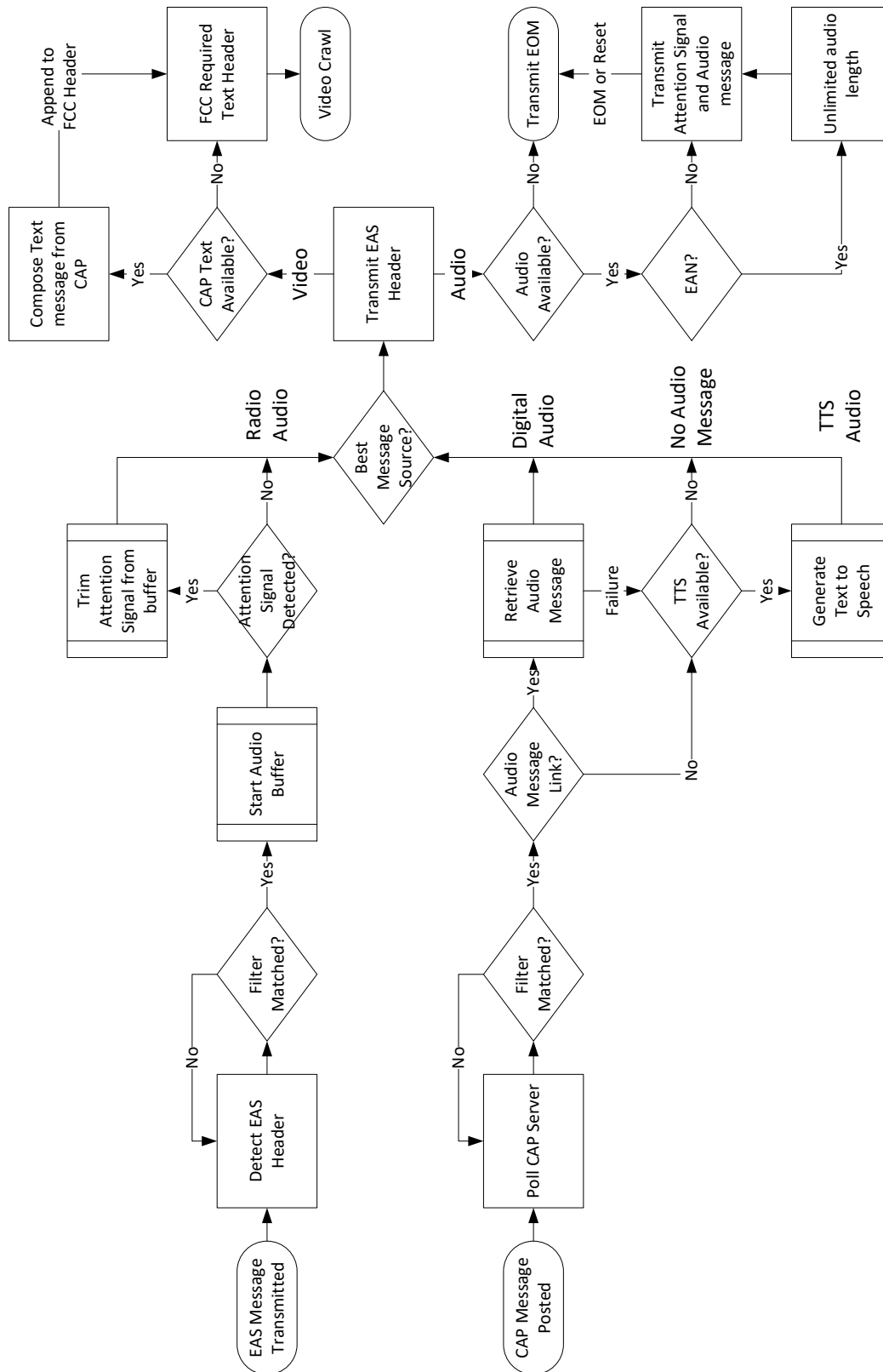
Figure 1 - Flowchart of EAS/CAP processing

Suggested Improvements

Documenting National EAS/IPAWS Operational Procedures

Although regulations need to be flexible and open ended, the FCC or FEMA also must publish a public guidance document addressing operational details in order for participants to properly configure their systems. For example, on September 14, 2016, FEMA IPAWS transmitted a RWT weekly test, using the 00000 location code, and a CIV organization code. Should participants expect other CIV originators use the 000000? Should the 000000 only be used by PEP national originators? Would the PEP origination code or 000000 be used in combination with state/local event codes?

Ad hoc, and on the fly, configuration changes have increased risk of error. After FEMA transmitted the September 14, 2016 weekly test using 000000, some participants changed their equipment to accept 000000 with RWTs. However, at least one television station mistakenly transmitted its own weekly tests including 000000.

In 2012, the EAS Fifth Report and Order described the EAS Operating Handbook as follows:

> "Although we do not decide whether to retain the EAS Operating Handbook here, if we elect to retain it, as most commenters support, it will at most serve as an informational document to aid EAS Participant personnel in handling EAS messages manually. It will not itself establish any procedures (such as on-air announcements) that must be followed."[1]

Instead of an informational document, in 2016 the FCC published a new mandatory EAS Operating Handbook which could not be corrected or changed by participants. In addition, it removed all informational guidance from the handbook. The lack of published operational guidance by FCC and FEMA increases the risk that FEMA, and national leadership, may transmit unexpected message codes. And participants will not have settings configured to support those unexpected codes for national operations if it is ever needed.

Checking CAP versus EAS message sources

The current EAS rules §11.54(c) allow participants to use alternative audio feeds of the President's voice message, but in practice all current EAS equipment latches onto the first EAS/CAP source received. When neither a CAP audio file or Text-to-Speech are available, the best version may be an analog EAS radio monitoring source instead of CAP with no audio. While using the first source received should be acceptable, for backwards compatibility; I suggest the FCC guidance encourage EAS equipment check multiple sources for the best available source.

I advise against triggered IPAWS polling when an analog EAS message is received. Content Distribution Network (CDN) caching works best when polling queries are randomly distributed.

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[1] Federal Communications Commission, Fifth Report and Order, 2012., paragraph 211.

If all the triggered queries in an area occur at the same time, they may all experience a CDN cache miss because the Content Distribution Networks don't have time to populate their caches.

Instead, when the EAS device decodes an alert, it should continue normal polling for one or two polling intervals while checking for a better CAP message or a better EAS source. After a brief interval, i.e. 30 to 150 seconds including time-out delays, of checking all monitoring sources; EAS equipment should continue with the "best" quality source available, e.g. Network feeds, CAP sources, FM sources, AM sources, VHF sources, etc. This may need to be adjustable because some participants in remote locations with satellite communications latency require longer connection time-out delays. As soon as the most preferred source is received, EAS equipment may be configured to immediately relay that alert source.

Immediate versus Without unnecessary delay

The need for speed is important for any warning system, but more important is an understandable message. Requiring instantaneous reaction means no time to check other sources for better quality or verify messages. That doesn't mean lengthy delays waiting for a break in programming, or tape-delayed for different time zones.

What is the actual EAS reaction time requirement? Executive Order 13407 revoked the "Presidential Communications with the General Public During Periods of National Emergency," commonly referred to as the White House Statement of Requirements. It was supposed to be replaced by new guidance, however the Federal Emergency Management Agency did not publish replacement guidance or requirements.

Previous White House Statement of Requirements have varied. Since 1963, they have generally stated a 5 to 10-minute reaction time for a Presidential audio address to the Nation. Some versions also included a three-hour reaction time for a Presidential video address. Although the reaction time was stated as a maximum, the previous statements also requested reducing the reaction time when possible.

Since FEMA hasn't published updated requirements for Presidential messages after EO13407, let's assume the current requirements are similar to the previous requirements. This is not intended as a strict engineering specification, but as an operating goal. Assuming a 10-minute reaction time for the audio broadcast is split evenly between
1. Maximum 5-minute intra-government reaction time from Presidential decision until FEMA activates PEP stations and/or IPAWS
2. Maximum 5-minute industry reaction time from start of the PEP transmission to the reach the furthest listener at the end of the EAS daisy-chain
    a. Maximum 2:30 minutes from PEP across State Relay Networks to Local Primaries
    b. Maximum 1:15 minutes from LP to Participating Nationals
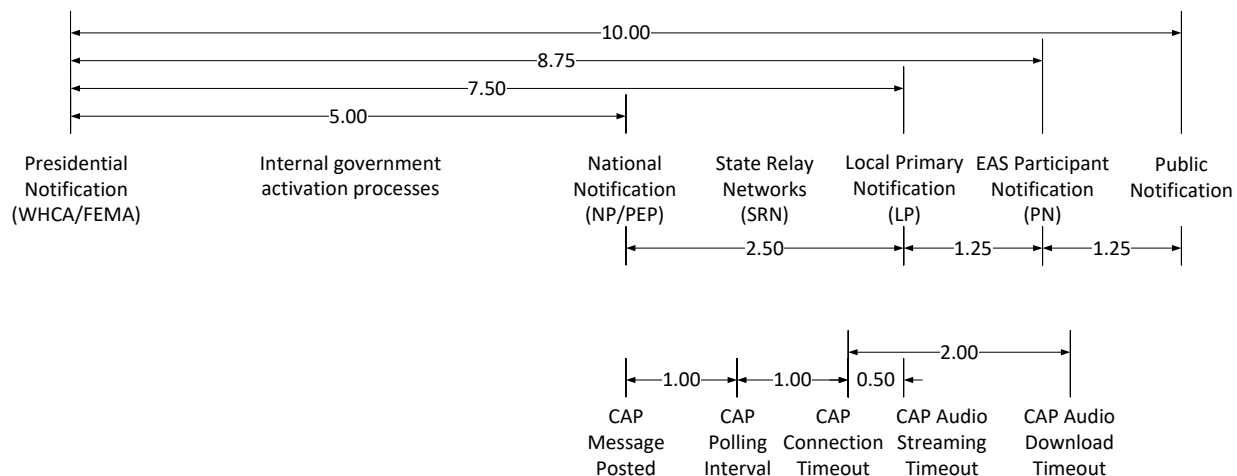   c. Maximum 1:15 minutes from PN to listener

Figure 2 – Worst case EAS activation timeline (decimal times)

Because exact reaction and transmission times will vary by technology which are always changing, e.g. satellite latency, digital encoding, automation processing, the FCC should not over-specify. My suggestion is the FCC guidance should establish guidance that "immediate" does not require instantaneous reaction, but should be without unnecessary delay.

Allowing 30-150 seconds (maximum 2-1/2 minutes) for processing alerts would still meet the required reaction times, while allowing time to check other monitoring sources and validate alert messages. This may need to be adjustable because participants in remote locations with satellite communications latency require longer connection time-out delays than participants with low-latency connections. As soon as a preferred source is received, EAS/CAP equipment may be configured to short-circuit the processing delay and relay the preferred source. If a preferred source is not received during the processing period, the EAS/CAP equipment uses whatever source is available.

Text to Speech versus No audio message

I suggest the FCC revisit its Text-to-Speech guidance. Currently, TTS is optional and some participants have TTS disabled or not present in their EAS/CAP equipment. The FCC prohibited TTS at one time, which meant some CAP devices were shipped or configured without TTS. While text-to-speech has issues, it is usually better than no audio message. When LP-1/LP-2 stations transmit an EAS message with no audio, the de-duplication process of downstream stations blocks using other sources. They only relay the first EAS message received, even if it has no audio message.

Message text from EAS protocol header and CAP fields

The rules (§11.51 (d), (g)(3), (h)(3), and (j)(2)) require combining both the EAS protocol header translation and CAP text fields for the video text means the video crawl doesn't match the audio message. For backwards compatibility, it is necessary to use the EAS protocol header translation when CAP text is unavailable. When the CAP text is available, the rules should be updated not to require the EAS protocol header translation. This would simplify text-to-speech

when an audio file is not available, only the CAP text would need to be announced which contains the information emergency officials want the public to know. Often the EAS protocol header is misleading (i.e. county-wide locations, vague event code translations) compared to the information in the CAP text fields.

Modern video graphic presentation

The public's experience is important for the success of all types of systems, including public alert and warning systems. Acceptable video graphics and audio quality change over time. In the past, this was a static slide and low-resolution character generators. While the FCC should not over-specify the user experience, FCC and FEMA can improve the public alerting experience by encouraging and recognizing EAS participants with user-friendly alert presentations.

A common public alerting experience was an EAS video crawl over programming. I have not included examples of a video crawl over programming because the background programming may be copyrighted.

Some EAS video participants had modern looking EAS graphics for the National Test. The FCC can obtain video samples from broadcast monitoring services, FEMA and YouTube.
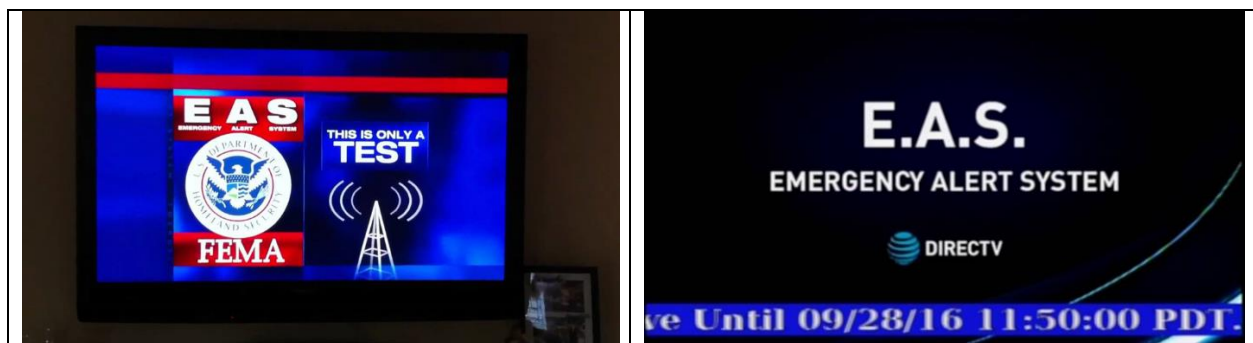

Figure 3 - EAS text crawl over full-screen graphics

Other EAS video participants had character generator text on blank backgrounds. This format was common on cable systems with force tuning.
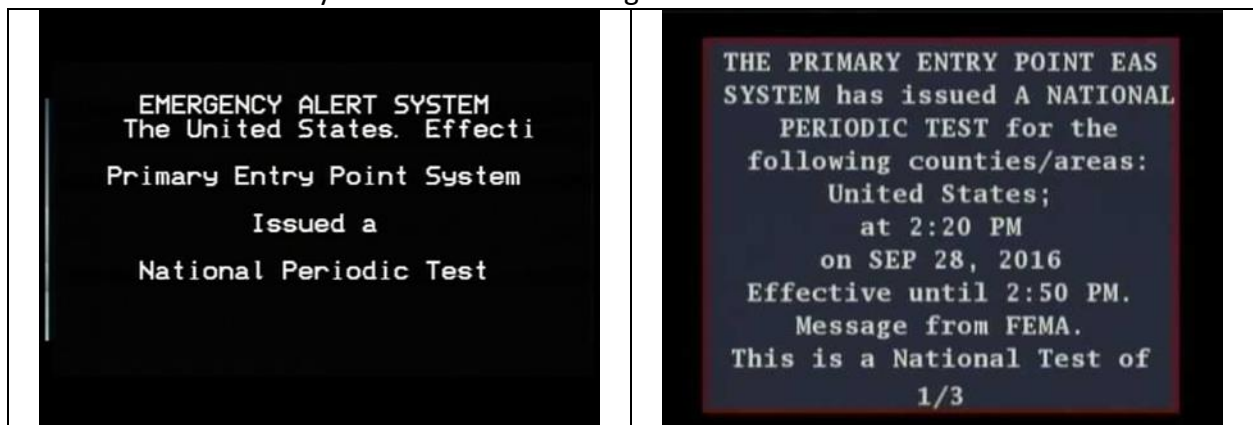

Figure 4 - EAS Character Generator screens

Next is a mock-up of CAP text roll and background graphic (Figure 5):

- The mockup keeps of EAS event name on the screen (National Test) while the full CAP message text rolls below it
- The "National Test" symbol based on National Alliance for Public Safety GIS (NAPSG) public alerting symbols.
    - NAPSG doesn't have a Test symbol, so the mockup uses a green triangle and check-mark to indicate a test. Standard symbols (with the event name) could be used in multi-lingual material and related warning systems such as Wireless Emergency Alerts. However, some hazards and concepts are difficult to represent as a symbol or in some languages.
- When available, the CAP message text is semi-synchronized to the audio portion of the alert message.
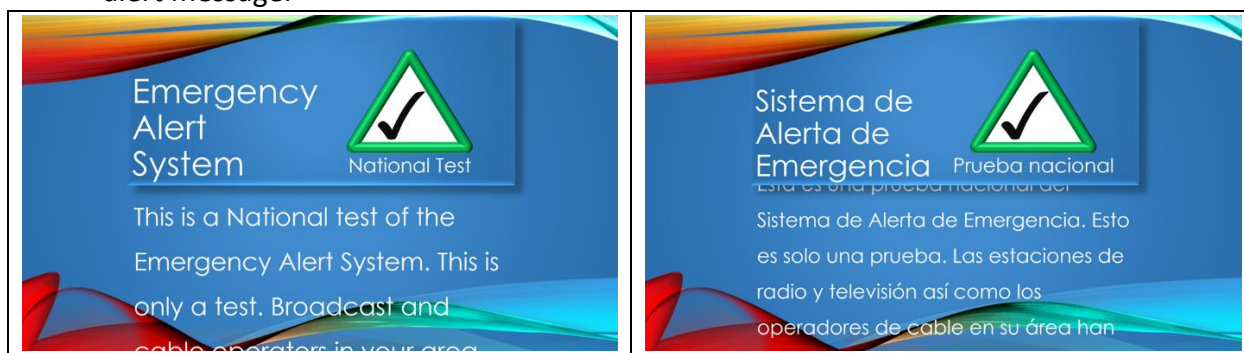

Figure 5 - CAP English and Spanish language versions

Audio-video versions of the EAS video mockups are available at

http://www.donelan.com/EAS-National-Test-Mockup.mp4

http://www.donelan.com/EAS-Sample-Alert-Mockup.mp4

These are only samples, and not intended to be proscriptive. EAS participants could be encouraged to improve the public alerting experience, while still treating it seriously.

Future National Tests

In future national tests, FEMA should consider:

1. A PEP-only origination national test to verify resolution of problems with that distribution channel.
2. An integrated test across all national public alerting and warning systems (EAS, NWEM and WEA) to check for congestion or other interaction between systems.
3. An overnight national test or time-zone specific tests to check if any nighttime issues affect the system. Due to territories stretching across many time-zones, it may be overnight in the continental US.

FEMA should continue minimizing the public impact, and annoyance, of future national tests.

Conclusions

I commend all EAS participants, FEMA and the FCC for a much-improved national test performance. The audio message quality was generally excellent, and a majority of EAS participants appeared to forward the alert without significant problems. FEMA still needs to re-visit conducting a national alert using the Primary Entry Point System to confirm that channel's problems have been resolved and no other problems introduced.

If you have any questions concerning these comments, please do not hesitate to call (703-892-1810) or email (sean@donelan.com) me.

Respectfully submitted,

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